THE DEPARTMENT OF ELECTRONICS AND NANOENGINEERING (ELE)

is now looking for Bachelor or Master students for several

SUMMER JOB POSITIONS

How to apply?
Submit your application through our recruiting system by using the “Apply now!” link: http://www.aalto.fi/en/about/careers/jobs/view/3052/

Please include the following documents:

- CV
- Study records

You can apply for one or several of the open positions. Please mark the codes of the positions you are interested in under the field “*Further information on the positions that you are interested in*”. Prioritize your choices with numbers; 1. code for your first choice, 2. code for your second choice, etc.

Depending on the position, the summer job will last for max. 4 months and is carried out between May and September 2021. Please note that these positions are available for undergraduate students only.

If you are interested in any of the positions, we are really looking forwards to hearing from you – please leave your application as soon as possible, but latest at **8 February 2021**. We will start reviewing candidates immediately, and the positions will be filled as soon as suitable candidates are found.

In recruitment process related questions, please contact HR Secretary Emma Malmi (hr-ele@aalto.fi).

The Department of Electronics and Nanoengineering (ELE) *conducts research and arranges related courses in the field of electromagnetics, micro and nanotechnology, radio engineering, and space technology featuring an international team of over 150 Researchers and Research Assistants. The Department is part of the Aalto University School of Electrical Engineering (Aalto ELEC) with world-class research facilities and instruments.*

PHOTONICS AND NANOTECHNOLOGY

PHOTONICS – Learn more about the research group here.

Manipulating light at the nanoscale / Code: [2D-Nano]

Manipulating light at the nanoscale is possible in specially designed structures of nanometer size. For example, some devices can confine light in a small volume, which can be used for the study of interesting physical phenomena, such as the hybridization of light combined with matter. This hybridization consists of a provision of matter properties to light, which is naturally massless. Providing light with matter properties opens up the opportunity to explore exotic ways of energy transfer, and possibly to realize science-fiction tools like the light sabers depicted in the Star Wars movies. The successful candidate will join an ongoing experimental research on this topic. In this research we combine light and matter in specially designed devices. This allows us to explore how light-matter hybridization modify properties of materials. The successful candidate will have access to the excellent research environment and handle the advanced optics techniques in the photonics group. The position is suitable for students who want to carry out a special assignment or continue to a Master/doctoral thesis.

Further information: Dr. Henry Fernandez Pizarro (henry.fernandez@aalto.fi) and Prof. Zhipei Sun (zhipei.sun@aalto.fi)

Ultrafast camera to record electrical dynamics / Code: [2D-Ultrafast]

The aim of this project is to make an ultrafast camera to capture the ultrafast carrier dynamics in monolayer semiconductors by building a pump-probe system with a femtosecond-pulsed laser. The camera is expected to have the ability to measure dynamics down to 10^{-13}s. We are seeking highly motivated and enthusiastic applicants with interest in ultrafast optics and laser techniques. Studies / knowledge in the field of lasers, optics and/or physics are beneficial. The successful candidate will have access to the excellent research environment and learn the advanced optical techniques. The position is suitable for students who want to carry out a special assignment or continue to a Master/doctoral thesis.

Further information: Mr. Yadong Wang (yadong.wang@aalto.fi) and Prof. Zhipei Sun (zhipei.sun@aalto.fi)

Nonlinear photonics with nanomaterials Code: [2D-Photon]

The aim of this summer job is to fundamentally understand the nonlinear optical responses of nanomaterials such as graphene and other two-dimensional layered materials. The well-planned summer work consists of optical experiment setup, linear and nonlinear optical characterization. However, the research content can be tailored to fit with applicant's research interest, for example, for a student interested in challenges of understanding fundamentals and physics. The position is suitable for students who want to carry out a special assignment or continue to a Master/doctoral thesis.

Further information: Dr. Yunyun Dai (yunyun.dai@aalto.fi) and Prof. Zhipei Sun (zhipei.sun@aalto.fi)

ELECTRON PHYSICS – Learn more about the research group here.

High-performance semiconductor devices / Code: [SEMI]
Modern semiconductor devices have revolutionized multiple technologies including electronics, photovoltaics and telecommunication. This is largely due to achievements and scientific breakthroughs made in academic research. Now you have an opportunity to contribute to this cutting-edge research by becoming part of a research team that develops materials, processes and device concepts of the future. More specifically, you can participate in designing and processing high-performance semiconductor devices such as optical sensors and solar cells, their electrical and optical characterization as well as simulations. The exact content of the work will be tailored based on the applicant's own skills and interests.

The position is suitable for both Bachelor and Master level students including freshmen. During the summer it is also possible to carry out a special assignment or already start working on Master's thesis. This position is also ideal if you are thinking of continuing towards Doctoral degree.

Further information: Prof. Hele Savin (hele.savin@aalto.fi)

ORGANIC ELECTRONICS – Learn more about the research group here.

Materials and interfaces to enhance organic devices performances / Code: [ORGANIC]
The Organic Electronics Group is looking for a curious and talented student, either at BSc or at MSc level, for the Summer 2020. You will contribute to the advance of a novel class of organic devices (organic light emitting transistors); in particular, your role will be to develop thin films, both dielectrics and organics, in order to study and improve device performances. Experimental work will include growth of materials, surface characterization and device fabrication.

Further information: Prof. Caterina Soldano (caterina.soldano@aalto.fi)

MICRO AND QUANTUM SYSTEMS – Learn more about the research group here.

Renewable hydrogen production by solar photoelectrochemical water splitting: fabrication and characterization of semiconductor and catalytic materials / Code: [MQS1]
Position open for a master student in the fields Electrical Engineering, Applied Physics or Chemical Engineering. Water splitting, also known as artificial photosynthesis, is a process that separates water into hydrogen and oxygen, by using sunlight as a source of photoelectrochemical energy.
This process enables the production of clean, renewable hydrogen, which in turn can be used as fuel, or drive other chemical reactions. Promising active materials for this process are metal oxides (hematite, bismuth vanadate and many others) and catalyst nanoparticles. The current technological challenge rests in increasing their efficiency and their durability, by engineering their bandgap (doping and nanostructuring), and by increasing their resistance to corrosion (protective and catalytic coatings). The student will be involved in the fabrication, processing and characterization of the material, by nanofabrication techniques, optical spectroscopy, and photoelectrochemical characterization. The position will provide hands-on experience in a laboratory and in a cleanroom environment and knowledge of research methods and protocols. The work can also be extended into a master's thesis.

Further information: Prof. Ilkka Tittonen (ilkka.tittonen@aalto.fi), M.Sc. Camilla Tossi (camilla.tossi@aalto.fi)

Experimental work on novel materials for carbon dioxide catalysis: fabrication and optical characterization of catalysts, for energy applications / Code: [MQS2]
Position open for a master student in the fields of Electrical Engineering, Applied Physics or Chemical Engineering. Controlling the levels of CO2 in both the atmosphere and the oceanosphere is of paramount importance in order to reduce global warming and tackle climate change. The catalytic reduction of CO2 into less dangerous products is a direct solution to reduce the amount of carbon compounds in the atmosphere and increase the efficiency of renewable energy sources. The work focuses on optimizing the catalytic reaction of CO2 to produce value-added fuels and chemicals such as carbon monoxide (CO), hydrocarbons (methane: CH4, ethylene: C2H4) and alcohols (ethanol: C2H5OH). In order to do that you will design, fabricate and characterize catalysts such as: 2D heterostructures (MoS2, ZnSe) or metal oxides (TiO2, CuO2) and also, noble-metal plasmonic nanoparticles, with the goal of incorporating them in our microfluidic cell. The position includes hands-on work in laser laboratories and in a cleanroom environment, and can be extended into a master's thesis.

Further information: Prof. Ilkka Tittonen (ilkka.tittonen@aalto.fi), M.Sc Ornella Laouadi (ornella.laouadi@aalto.fi)

Computer simulations of nanoscale physical systems / Code: [MQS3]
The goal of the scientific method and the core of all research is to understand the world around us and ultimately develop a theory that explains our observations. In this task you get the opportunity to participate in the development of computer simulations that explain measured results in direct collaboration with the experimental work done in our research group. The simulations could be related to different topics encountered in micro- and nanoscale systems, such as semiconductor physics, fluid dynamics or electrochemistry. Good knowledge of physics, chemistry, quantum mechanics and MATLAB/python or some other programming language are considered an advantage. Suitable for students who wish to continue to a master's thesis.

Further information: Prof. Ilkka Tittonen (ilkka.tittonen@aalto.fi), M.Sc. Lassi Hällström (lassi.hallstrom@aalto.fi)

Nanostructured materials for thermoelectrics / Code: [MQS4]
Thermoelectric materials are capable of harvesting heat and converting it into electricity. They thus present an exciting alternative for producing clean energy. Engineering the nanoscale material structure is an effective way to improve their efficiency and performance. The position consists of experimental hands-on work on developing new thermoelectric nanomaterials and their characterization methods. Depending on the interests of the applicant, the work can include either fabrication of novel materials or building of an optical thermal conductivity measurement setup. The work can be extended into a thesis work.

Further information: Prof. Ilkka Tittonen (ilkka.tittonen@aalto.fi), M.Sc. Tomi Koskinen (tomi.koskinen@aalto.fi)

Experimental quantum illumination / Code: [MQS5]
It has been discovered in the last 10 years or so that quantum properties of electromagnetic waves can be used to enhance measurement sensitivity. For example, the quantum entanglement between pairs of photons makes it easier to detect photons that are reflected off some target. This setup is called quantum illumination. The applications of quantum illumination range from low-intensity optical measurements via quantum microwave radar to quantum communication and cryptography.
The task for this summer project is to assist in the experimental realization of the quantum

illumination setup. The aim is to study how the measurement sensitivity of the system depends on various factors, such as background noise, distance of the object from the receiver, etc.
Depending on the level of the student, this summer project can be extended to a thesis work.

Further information: Prof. Ilkka Tittonen (ilkka.tittonen@aalto.fi), D.Sc. Vladimir Kornienko (vladimir.kornienko@aalto.fi)

Role of entanglement and contextuality in quantum computational speedup / Code: [MQS6]
Currently several quantum algorithms are known (e.g., Shor's factoring algorithm), which offer a significant speedup compared to the fastest known classical algorithm for the same computational task. The source of the quantum speedup is not yet well understood, although it is suspected that quantum entanglement and contextuality play important roles. The task for the offered summer project is to track and visualize the time-evolution of quantum entanglement and contextuality during the running of various quantum algorithms to explore the connection between these quantities and quantum speedup. As for example the current cryptography methods are threatened by quantum computing, and new quantum-safe methods are currently under development, understanding better the limits of the quantum computational speedup has profound implications for cyber-safety, among other applications. Depending on the level of the student, this summer project can be extended to a thesis work.

Further information: Prof. Ilkka Tittonen (ilkka.tittonen@aalto.fi), D.Sc. Matti Raasakka (matti.raasakka@aalto.fi)

Genetic design of quantum algorithms for problems related to post-quantum cryptography / Code: [MQS7]
The current cryptography methods are threatened by quantum computing, and new quantum-safe methods, the so-called 'post-quantum' cryptography (PQC), are under intense development. The proposed PQC methods are based on certain mathematical problems that are believed to be too difficult even for quantum computers to solve. However, as the exact limits of quantum computing are currently not well understood, it is not totally clear if the proposed PQC methods are truly quantum-safe. The task for the offered summer project is to take part in the automated development of quantum algorithms for problems related to PQC. Genetic optimization will be used to generate new quantum algorithms. We will then study the efficiency of the quantum algorithms thus discovered. This work may have important implications for the safety of the proposed PQC methods. Depending on the level of the student, this summer project can be extended to a thesis work.

Further information: Prof. Ilkka Tittonen (ilkka.tittonen@aalto.fi), D.Sc. Matti Raasakka (matti.raasakka@aalto.fi)

Quantum machine learning in the NISQ era / Code: [MQS8]
Quantum computers in the near future will have a very limited number of qubits and are subject to significant noise. This period of time has been dubbed the Noisy Intermediate Scale Quantum (NISQ) era of quantum computing. In this era, it is not possible to use quantum algorithms such as Shor's factoring algorithm or Grover's search algorithm. Therefore, there is a lot of interest in finding useful tasks based on short quantum programs which could be demonstrated in NISQ-era quantum computers. Machine learning has seen massive successes in various real world tasks, for example, in image classification and natural language processing. These models are trained on vast amounts of data and can require ever-increasing computational resources to successfully optimize. The sizes of these models and the effort required in training them is quickly becoming prohibitive. The field of quantum machine learning attempts to find quantum algorithms which would perform similar learning tasks with significantly fewer resources. The task in this summer project is to help in

the development of quantum machine learning models. The work includes practical programming of quantum algorithms and benchmarking their performance on classical datasets. The ultimate goal is to better understand what is required to achieve quantum advantage in learning tasks. Basic familiarity with quantum mechanics, classical machine learning, and Python programming are considered advantages but are not strictly required.

Further information: Prof. Ilkka Tittonen (ilkka.tittonen@aalto.fi), D.Sc. Matti Raasakka (matti.raasakka@aalto.fi), D.Sc. Arttu Pönni (arttu.ponni@aalto.fi)

MICROWAVE AND INTEGRATED CIRCUIT DESIGN

ANTENNAS AND PROPAGATION – Learn more about the research group here.

Fabrication of antenna arrays for 5G infrastructure / Code: [SMARTWALLS]
Are you a Master's level student with a strong background in microwave engineering? We a looking for a summer trainee to optimise and manufacture ultrawideband antennas that are integrated in an array to be embedded into building walls. We develop “smart walls” for residential and office buildings, forming part of the 5G infrastructure. Radiation properties of the embedded antenna arrays are measured in an anechoic chamber to verify its performance compared to simulations.
If you are skillful in antenna design and fabrication, this is the right summer trainee opportunity for you. As a successful summer trainee you may be able to continue as a master’s thesis worker with full salary support.

Further information: Prof. Katsuyuki Haneda (katsuyuki.haneda@aalto.fi)

Programming waveforms and algorithms in universal software defined peripherals / Code: [USRP]
Do you have experience with LabView? We are looking for a summer trainee to implement the control of universal software defined peripherals (USRPs) through LabView. This includes programming the transceiver waveforms and algorithms for multiple-input multiple-output radio communications. You can be a Master's level student or a third-year Bachelor-level student. If you are knowledgeable in Labview and/or wireless systems, this is the right summer trainee opportunity for you.

Further information: Prof. Katsuyuki Haneda (katsuyuki.haneda@aalto.fi)

Millimeter-wave antenna and field measurements for future generation cellular / Code: [MEAS]
Do you have a good background in electronics as well as basic experience in practical measurements, such as with oscilloscopes, spectrum analyzers, network analyzers, signal generators or in an anechoic chamber? We seek a summer trainee to participate in various measurements of antennas and field strengths, which are led by senior researchers. The trainee will obtain a solid experience in practical radio frequency measurements. You can be a Master's level student or a third-year Bachelor-level student. As a successful summer trainee you may be able to continue as a master’s thesis worker with full salary support.

Further information: Prof. Katsuyuki Haneda (katsuyuki.haneda@aalto.fi)

ANTENNAS AND WIRELESS SENSORS – learn more about the research group here.

Advanced mobile antennas / Code: [MOBANT]
Join our research group to develop antennas for future mobile devices. We offer you challenging and interesting tasks, which we tailor according to your interests, skills and level of studies. Your tasks could include antenna design and characterization using an electromagnetic simulator, antenna prototyping and measurements. You will have a possibility to carry out a special assignment or write a candidate or master's thesis. We look for excellent students on any level of studies.

Further information: Dr. Anu Lehtovuori (anu.lehtovuori@aalto.fi) and Prof. Ville Viikari (ville.viikari@aalto.fi)

Millimeter-wave antennas / Code: [MMWANT]
Join our research group to develop future beam-steerable millimeter-wave antennas. We offer you challenging and interesting tasks, which we tailor according to your interests, skills and level of studies. Your tasks could include antenna design and characterization using an electromagnetic simulator, antenna prototyping and measurements. You will have a possibility to carry out a special assignment or write a candidate or master's thesis. We look for excellent students on any level of studies.

Further information: Dr. Juha Ala-Laurinaho (juha-ala-laurinaho@aalto.fi) and Prof. Ville Viikari (ville.viikari@aalto.fi)

RF power transfer for wireless devices / Code: [RFPT]
Ambient re-scattering communication principle is foreseen to be part of 6G. In this scheme, battery-less devices harvest power from ambient radio waves and reuse the waves for communications in a parasitic manner. Join our research group to develop this RF-powered devices. We offer you challenging and interesting tasks, which we tailor according to your interests, skills and level of studies. Your tasks could include antenna design and characterization using an electromagnetic simulator, antenna prototyping and measurements. You will have a possibility to carry out a special assignment or write a candidate or master's thesis. We look for excellent students on any level of studies.

Further information: Univ. Lect. Jari Holopainen (jari.holopainen@aalto.fi) and Prof. Ville Viikari (ville.viikari@aalto.fi)

ELECTRONIC CIRCUIT DESIGN – Learn more about the research group here.

Open source Risc-V microprocesser implementation with Chisel / Code: [IC_Processor]
Are you the one born with enthusiasm towards programming and microprocessors? This is the dream job for you. Risc-V is an open source microprocessor instructionset, which is gaining interest in academia and industry. In Aalto, Department of Electronics and nanoengineering, we are looking for our own open source Risc-V core implementation that we can use as a controller in our mixed-mode System-on-Chip designs. Simultaneously we provide hands-on education on Digital SoC design to fulfill the rapidly growing need of Finnish electronics industry. In this work we start from basics.

Successful execution of the work requires willingness to learn fluent unix working habits, Git version control, shell scripting, Python, and Scala/Chisel Programming, complemented with entry level knowledge of analog design tools and methodology. Topic focuses on implementation of Risc-V instruction With Scala/Chisel, possibly advancing to implementation on silicon or verification on FPGA according to your preferences. The position is appropriate for B.Sc. and M.Sc. students eager to learn with a hint of enthusiasm to go where very few has gone before.

Further information: Dr. Kari Stadius (kari.stadius@aalto.fi), Dr. Marko Kosunen (marko.kosunen@aalto.fi) and Prof. Jussi Ryynänen (jussi.ryynanen@aalto.fi)

Digital circuit design implementations for 6G and beyond SoCs / Code: [IC_PROG_6G]
Are you interested being a part of historical change in circuit design paradigm? Are you willing to learn to work fluently in Unix environment with various programming languages and have still lots of interest on electronic circuits? If yes, this is the job for you. As a summer trainee in this area you will participate developing Circuit and system models, and implementing them with Chisel, as Scala based hardware description language. Programmatic approach automates the burdensome manual labor in circuit design process and enables optimization of the circuits algorithmically, providing optimal solutions for given specifications. In this work we start from basics.

Successful execution of the work requires willingness to learn fluent unix working habits, Git version control, shell scripting, Python, and Scala/Chisel Programming, complemented with entry level knowledge of analog design tools and methodology. Topics include programmatic design of analog and digital building blocks for communications System-on-Chip or on digital FPGA, according to your preferences. The position is appropriate for B.Sc. and M.Sc. students. This position can be continued as a Master's Thesis work during fall.

Further information: Dr. Kari Stadius (kari.stadius@aalto.fi), Dr. Marko Kosunen (marko.kosunen@aalto.fi) and Prof. Jussi Ryynänen (jussi.ryynanen@aalto.fi)

Analog building block design with Berkeley Analog Generator / Code: [IC_BAG]
The rumors about the death of Analog electronics are premature, as Analog just went Programmatic. If you are willing to learn how to design Analog microelectronics by defining the parametrized implementation with Python, this is the dream job for you. Analog building blocks are needed in every piece onf microelectronics and Systems-on-Chip, like digital circuitry and microprocessors. Programmatic design methodology aims to provide parametrized and optimized analog building blocks for these needs. Berkeley Analog Generator is a design environment recently developed in University of Berkeley which enables analog circuit design by programmatic means. In Aalto we are looking for pioneer students with enthusism to learn to take this new methodology into use. If you want to be a game changer, this is your moment. In this work we start from basics.

Successful execution of the work requires willingness to learn fluent unix working habits, Git version control, shell scripting and Python programming, complemented with entry level knowledge of analog design tools and methodology. Topic focuses on implementation of analog building blocks for A/D converters, 5G mmWave circuits, radio transmitters and receivers according to your preferences. The position is appropriate for B.Sc. and M.Sc. students eager to learn new things with devotion to acquire skills of the future.

Further information: Dr. Kari Stadius (kari.stadius@aalto.fi), Dr. Marko Kosunen (marko.kosunen@aalto.fi) and Prof. Jussi Ryynänen (jussi.ryynanen@aalto.fi)

Integrated Circuits for 6G communications / Code: [IC_6G]
The next generation communications are here. In addition of providing extremely fast data speeds, the future systems can sense their environment and, in some cases, operate via wirelessly transmitted power. The work is related to future transceiver IC development. The summer trainee joins our design group and contributes to design of a specific block or transceiver architecture under guidance of a senior designer. The topic can be in the fields of mm-wave/RF/analog/mixed mode, upon interest of the student and demand of the on-going projects. We seek for a Master's level student that is enthusiastic on IC design. The work provides an opportunity to learn the use of industrial-level CAD environment and nanometer scale CMOS/BiCMOS technologies. This position can be continued as a Master's Thesis work during fall.

Further information: Dr. Kari Stadius (kari.stadius@aalto.fi), Dr. Marko Kosunen (marko.kosunen@aalto.fi) and Prof. Jussi Ryynänen (jussi.ryynanen@aalto.fi)

Integrated circuit design for AI accelerators / Code: [ICD-AI]
Artificial Intelligence (AI) applications have flourished in our everyday lives. We can cite for instance facial recognition systems, health applications, and many more. Yet, implementing these AI algorithms costs a lot of energy for classical processors, which currently limit the deployment of AI applications on the edge, i.e. smartphones or other wearables. In this summer job, you will join our design group and be involved in the design of several Integrated Circuit (IC) blocks to implement energy-efficient AI accelerators. These accelerators are dedicated hardware blocks, able to implement a given AI model on hardware, and compute it more efficiently that a traditional processor. This position is suitable for a Master level student. It requires a very good understanding of analog and mixed-signal IC design and interests in learning more about edge AI. It is possible to extend the work as a master thesis.

Further information: Prof. Martin Andraud (martin.andraud@aalto.fi)

Implementing probabilistic Artificial Intelligence models on edge devices / Code: [AI-M]
Artificial Intelligence (AI) applications have flourished in our everyday lives. We can cite for instance facial recognition systems, health applications, and many more. Yet, implementing these AI algorithms costs a lot of energy for classical processors, which currently limit the deployment of AI applications on the edge, i.e. smartphones or other wearables. In this summer job, you will join our design group and be involved in the implementation of probabilistic AI models directly on hardware platforms, such as Field Programmable Gate Arrays (FPGAs). In particular, you will build an AI accelerator for probabilistic models, able to take decision according to the most probable choice offered in a given situation. You will have use fabricated integrated circuits as a case study. This position requires knowledge about digital and mixed-signal circuit design, FPGA programming, python/C++ programming, and interests in learning more about edge AI. It is possible to extend the work as a master thesis.

Further information: Prof. Martin Andraud (martin.andraud@aalto.fi)

MILLIMETRE WAVE AND THz TECHNIQUES – Learn more about the research group here.

Near-field measurements with DNN-based beamforming arrays / Code: [THZ_DNN]
This summer job position is open for Bachelor-level students who are interested in electromagnetics, antenna measurements, and machine learning. The work is related to research project ADENN, which applies deep neural networks to beamforming arrays at submillimetre waves. The position gives an opportunity to be involved with completely new kind of approach to beamforming arrays in THz imaging. In practice, the work can include near-field antenna measurements as well as developing measurement instrumentation and deep neural networks for interpreting the radiation properties or received information.

Required skills: good programming skills in MATLAB and Python

Working language is Finnish or English

Further information: Dr Aleksi Tamminen (aleksi.tamminen@aalto.fi)

Design, construction, and testing of quasioptical systems for submillimeter wave and THz research / Code: [THZ_QUASI]
This summer job position is open for Bachelor level students with interests in optics, electromagnetics, and remote sensing. We are performing research in the areas of satellite remote sensing, imaging radar, and medical diagnostics. These applications present unique optical challenges that must be solved with a combination of ray and wave optics. You gain understanding of aspheric optical elements and perform simple optical simulations of lens/mirror systems. You will use CAD software to layout mounts and optomechanics. Finally, you will build your designed optical systems and evaluate performance and simulation accuracy with submillimeter wave sources and detectors.

Required skills: good programming skills in MATLAB and Python

Working language is Finnish or English

Further information: Prof. Zachary Taylor (zachary.taylor@aalto.fi) , Dr. Aleksi Tamminen (aleksi.tamminen@aalto.fi)

THz medical imaging using with photoconductive and RF multiplier sources / Code: [THZ_MEDI]
This summer job position is open for Bachelor level students with interests in optics, signal processing, and medicine. We are building imaging systems for (1) quantitative assessment of cutaneous burn wound severity, and (2) early detection of corneal disease. You will make phantom targets and characterize contrast mechanism sensitivity of photoconductive and RF source based architectures. You perform data analysis and processing of images to help identify areas where we can reduce the volume of acquired data to help speed up acquisition time

Required skills: good programming skills in MATLAB and Python

Working language is Finnish or English

Further information: Prof. Zachary Taylor (zachary.taylor@aalto.fi) , Dr. Aleksi Tamminen (aleksi.tamminen@aalto.fi)

SPACE SCIENCE AND TECHNOLOGY

SPACE TECHNOLOGY – Learn more about the research group here.

Foresail Test Assistant / Code: [Foresail]
The position involves various duties while testing the Foresail-1 satellite and software. The tests include functional, software, thermal vacuum, vibration and shock tests. Understanding of basic programming of embedded systems is required. Elementary knowledge in space technology and hardware skills are recommended.

Further information: Prof. Jaan Praks (jaan.praks@aalto.fi)

Aalto-3 satellite development engineer / Code: [A3-SD]
The position gives opportunity to work with Aalto-3 Student Satellite mission and concentrate on satellite systems integration, debugging and testing. The project can provide several different tasks, starting from electronics, software and mechanical design.

Further information: Prof. Jaan Praks (jaan.praks@aalto.fi)

SAR Remote Sensing and AI / Code: [SAR-AI]
Work with Sentinel-1 and ICEYE SAR satellite data to develop AI methods to extract image features from SAR Earth Observation images. The work involves work with SNAP toolbox, SARProZ toolbox and Matlab. Matlab programming skills required. The project will be defined later in more detail.

Further information: Prof. Jaan Praks (jaan.praks@aalto.fi)

Aalto Satellites Media for outreach / Code: [SAMI]
We search for a student with skills in Blender and/or graphical design software. The aim of the work is to create animations and renders for Foresail-1, Foresail-2 and Aalto-3 satellites. The work also includes development of Aalto Satellites web pages and graphical material.

Further information: Prof. Jaan Praks (jaan.praks@aalto.fi)

METSÄHOVI RADIO OBSERVATORY – Learn more about the observatory here.

Observations at the Metsähovi Radio Observatory / Code: [MRO]
Suitable for: Students who want to specialize in astronomy in their studies. Tasks: Solar and active galaxy observations using Metsähovi Radio Observatory's radio telescopes. Programming tasks related to astronomical data processing.
Required skills: The course "Radio Astronomy" or equivalent skills. Basics of Python, R, Perl, or C/C++.
Special requirements: The work takes place in Metsähovi, Kirkkonummi. Car (or similar) is required for reaching Metsähovi during summer holiday season.

Further information: Joni Tammi (metsahovi@aalto.fi)

ELECTROMAGNETICS

ADVANCED ELECTROMAGNETIC MATERIALS AND STRUCTURES – Learn more about the research group here and here: meta.aalto.fi.

Temporal modulation for exceeding conventional limitations in electromagnetic (optical) engineering / Code: [META1]
Changing the effective parameters of electromagnetic systems in time gives an exceptional opportunity to control the electromagnetic responses in a desired way, and, therefore, to provide a multitude of functionalities which cannot be (efficiently) achieved by using conventional time-invariant systems. We are looking for an enthusiastic student to join our international team and concentrate on this enchanting research area which has recently attracted significant attention in electromagnetic (optical) research communities. The student will help us to develop the theoretical understanding and do test designs of those dynamic systems. For reaching this goal, she/he will do theoretical investigations as well as numerical calculations employing such tools as HFSS, CST, and COMSOL. If you are interested in doing research in electromagnetism (optics), apply for this position. There is a possibility to complete investigations and present them as a special assignment or to continue working towards a master thesis.

Further information: Dr. M. Sajjad Mirmoosa (mohammad.mirmoosa@aalto.fi) and Prof. Sergei Tretyakov (sergei.tretyakov@aalto.fi)

Self-tuning wireless power transfer systems based on transmission line-embedded antennas / Code: [META2]
Wireless power transfer (WPT) technology has been applied in many fields including medical implants, consumer electronics, and electric vehicle charging. This project aims to study and optimize a new WPT system based on screened loop antennas. The proposed solution can be greatly beneficial for WPT applications in medical implants and MRI coils, providing self-tunability for varying receiver positions. The student will support the project team in simulating different electromagnetic structures and analyzing the results, as well as participating in experimental investigation. If you are excited about understanding the latest advances in WPT technology and have fundamental knowledge in electromagnetics, this will be an ideal opportunity for you. The experience with electromagnetics simulation tools (e.g., CST, COMSOL) will be advantageous. The successful candidate will join a multidisciplinary research group with an excellent environment for learning. There is a possibility to complete investigations and present them as a special assignment or to continue working towards a master thesis.

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Free-positioning wireless power transfer systems for movable small electric vehicles / Code: [META3]
There has been an increased usage of automated electric movers in many applications including, warehouse robots, retail robots, healthcare robots, and delivery drones. Electrification of these devices has become a challenge with classical plugged-in or docking charging because of range anxiety, reliability issues, downtime needed for charging, and high operating cost. In this project, we propose wireless charging as a solution that facilitates trouble-free charging for small electric vehicles. The proposed free-positioning wireless charging enables the devices to be charged wirelessly in a large area with a high-efficiency

above 95% regardless of the receiver position or orientation. If you are passionate to be a part of a team developing next-generation wireless charging solutions that can be directly applied in commercial products, this is an ideal opportunity for you. Your knowledge in power electronics and control systems will be an added advantage for this position. This is a collaborative project between the Department of Electronics and Nanoengineering and the Department of Electrical Engineering and Automation. You will have a great opportunity to improve yourself and learn new and emerging technologies in a multi-disciplinary research environment with very strong theoretical and practical expertise. There is a possibility to complete investigations and present them as a special assignment or to continue working towards a master thesis.

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